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Can Consumption Predict Advertising Expenditures?: The Advertising-Consumption Relation Before and After the Dot-Com Crisis in Germany

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Keywords: Advertising budgeting, private household consumption, consumer behavior, activist view, deterministic view, economic crisis, Granger causality, impulse response function

Abstract

Two contradictory schools of thought—the activists and the deterministsmpredict that either diffusion of knowledge (e.g., through advertising) leads to economic growth or that economic growth increases marketing and advertising activities. This study assesses the causal relation between corporate advertising expenditures and private consumption applying vector autoregressive (VAR) models to aggregate German quarterly data from 1991 to 2009. Results indicate a break in the advertising-consumption relation after the dot-com crisis. Hence, the macroeconomic advertising-consumption relation is not stable over time. Since 2001, consumption has Granger-caused advertising expenditures. This change suggests a higher relevance of consumer behavior for advertising budgeting decisions.

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INTRODUCTION

Advertising expenditures are closely related to the economic cycle[1] as companies tend to cut down their expenses in a recession. Hence, advertising markets struggle during economic crises. Being the most dominant contributor to media, media markets struggle as a result.[2]

Consumption as a measure of aggregate consumer behavior should show an even closer connection to advertising expenditures since most advertising is consumer targeted. While the dynamic interrelation between advertising and private consumption has been widely discussed,[3] a consensus has yet to be reached. The debate is based on two contradictory schools of thought, the "activist" and "deterministic" view:

According to the activist view, one of advertising's purposes is to activate demand by diffusion of knowledge and by influencing consumers' inter-temporal preferences.[4] This is based on the endogenous growth theory, which states that diffusion and accumulation of knowledge lead to economic growth. Therefore, both consumption and economic growth are expected to increase *in response* to advertising activity. Accordingly, lower advertising expenditures can negatively impact household consumption and, consequently, overall economic performance.

In the deterministic view, consumption is a determinant of advertising expenditures. On the one hand, it refers to a microeconomic point of view based on the idea that increasing income leads to an increase in demand. "Companies that want to have their share of the growing economic pie, for example, use advertising to attract new customers, and growing demand for personnel boosts recruitment advertising."[5] On the other hand, it can be traced back to the "principle of relative constancy (PRC)" that was originally formulated by McCombs in 1972 postulating a parallel development of consumers' as well as advertisers' spending on mass media and the general economy.[6] Thus, increasing (decreasing) revenues should result in increasing

(decreasing) advertising expenditures. Accordingly, one would assume the opposite direction of influence running from consumption to advertising expenditures.

In face of these arguments, the goal of this study is to detect whether consumption is useful to predict advertising expenditures that would enable decision makers to better anticipate future developments in media markets. From a media economic point of view, advertising is one of the most important financing sources for media organisations and a key factor for the existence of mass media systems. Being able to predict advertising revenues of media companies would close one important research gap in media economics. Therefore, we ask the following research question:

When can household consumption predict companies' advertising expenditures?

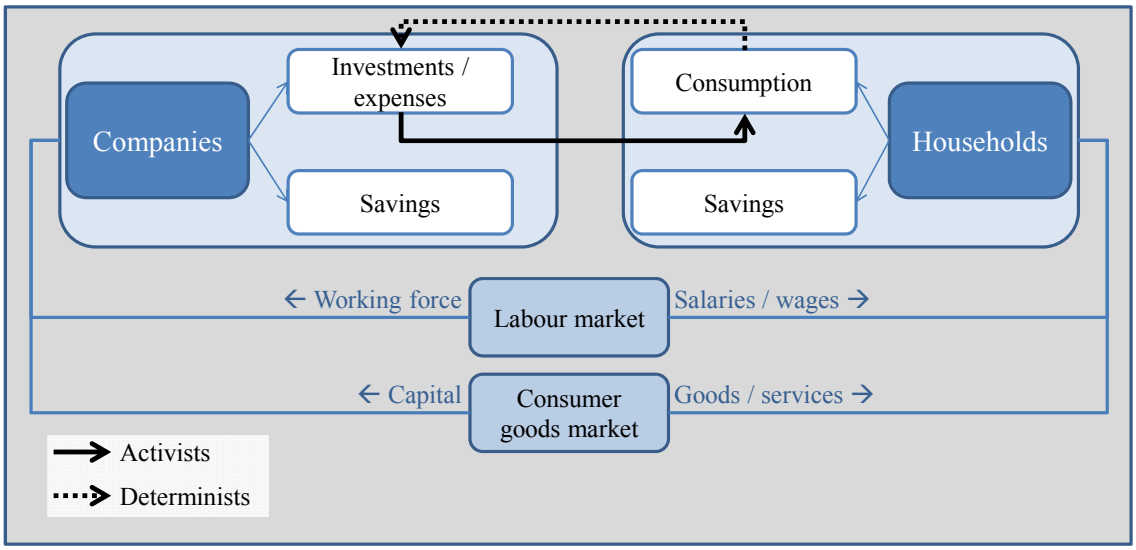
Our paper is structured as follows. First, we use a circular flow model to illustrate the economic relation between corporate advertising expenditures and household consumption. Then, we summarize the literature on this relation. We review the activist and deterministic argument and describe empirical results. Next, we apply vector autoregression (VAR) models, Granger-causality tests, and impulse response functions (irf) to German quarterly data on advertising expenditures and household consumption. The data cover the period fiscal quarter 1 in 1991 to fiscal quarter 4, 2009, therefore covering the period of the dot-com crisis in 2000. After discussing results, we close with conclusions and the study's limitations.

THEORETICAL REVIEW AND EMPIRICAL RELATIONS

A circular flow model illustrates potential relationships (in terms of accounting entities) in which economic behavior occurs. Household consumption and advertising expenditures of companies are parts of the circular flow that are not directly linked with each other (see **Figure 1**). Advertising expenditures can be considered company investments or expenses[7] that underlie a decision-making process generally involving costs, expected revenues, and therefore

also demand.[8] Household consumption can be considered returns to companies in trade of real goods or services that were subject to consumer choice.

Figure 1. Simple Circular Flow Model With Illustration of Activists' and Determinists' Assumptions



Note. Capital market not displayed

Source: Compiled by the authors

Of central concern in this study, the activists and deterministic arguments are visualized in the circular flow model (see

Figure 1). Representing the activist view, already Galbraith claims that advertising serves as a central instrument of an "effective management of consumer behavior."[9] Advertising expenditures are said to create demand for products (see bold black arrow in

Figure 1) by drawing income from savings to consumption. Contrarily, the deterministic view assumes that consumption drives advertising because higher sales derived from increased consumption lead to more advertising activities (see dotted arrow in

Figure 1). This cause-and-effect chain is considered to be consistent with the practitioners' rule wherein the advertising budget should comprise a share of sales, market share, or similar.[10] Accordingly, Hsu et al. find that, "whenever manufacturers realise more revenues from sales, they tend to spend more on advertising."[11] Note that these rules can be optimal for a company when the elasticity of demand increases with advertising expenditures.[12]

However, "[c]ommunications activities alone or in combination do not simply *cause* market impact…. In fact, a myriad of controllable and uncontrollable factors complicate the relationship between, say, a product advertisement run and the product sales afterward"[13] (emphasis in original) on the micro level. Therefore, empirical results testing the directional relation between advertising and consumption fail to provide a unified picture.

On the one hand, a set of studies often support that advertising has an impact on aggregate consumption. Taylor and Weiserbs[14] and Molinari and Turino[15] confirm the causal direction argued by the activists, running from advertising expenditures to aggregate consumption, using U.S. annual data from 1929 to 1968 and U.S. quarterly data from 1971 to 2005, respectively. In addition, Rehme and Weisser,[16] using German annual data from 1950 to 2000, show that advertising expenditures Granger-cause consumption. Also Sturgess and Wilson[17] show that advertising precedes consumption for German quarterly data from 1974 to 1982.

On the other hand, many studies support the determinists, finding a unidirectional causal relation from consumption to advertising expenditures. Ashley, Granger, and Schmalensee conclude from quarterly U.S. data from 1956 to 1975 that "fluctuations in aggregate consumption cause fluctuations in aggregate advertising."[18] Quarles and Jeffres[19] apply a path analytic framework for 53 countries, confirming the influence of income on consumption, which in turn influences advertising expenditures. Also Duffy[20] finds support for the deterministic view using quarterly U.K. data from 1963 to 1985 for non-durables. Hsu et al.[21] apply a VAR model including Granger-causality tests and impulse-response functions to annual U.S. aggregate data to examine advertising expenditures and consumption from 1848 to 1995. Whereas impulse response functions do not show significant impacts between changes in consumption and advertising, Granger-causality tests show that consumption helps to predict future advertising—but not the other way around.

Additionally, there are also studies that find both directions of influence[22] or no causal relation.[23]

Inconsistent results of former studies might derive from different time horizons or different levels of temporal aggregation. Most importantly however, none of the studies considered possible shifts in the relation between advertising and consumption during their observation periods, although "model stability over such a long period of time is highly unlikely."[24] Within each observation period, there could be periods with structural changes and therefore different causal relations between both variables. Ignoring structural changes is perilous and could lead to inaccurate forecasts.[25]

METHOD

Sample and Procedures

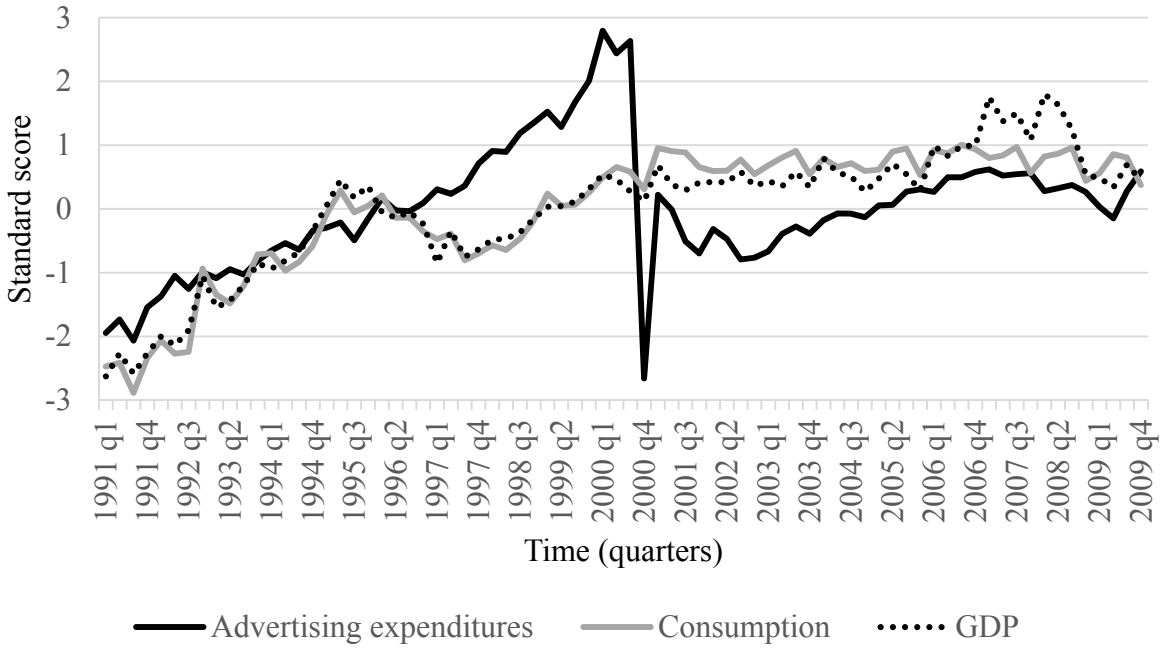
This study analyzes the relation between total advertising expenditures (on newspapers, magazines, journals, television, and radio) and aggregate private household consumption, accounting for potential structural breaks over time. We also include GDP—which correlates with consumption as well as advertising expenditures—in order to eliminate the impact it might have on the relationship between our two focal variables. This way, we make sure that the relation between consumption and advertising is not solely driven by GDP. We use quarterly data for Germany from fiscal quarter 1, 1991 to fiscal quarter 4, 2009. Data on advertising expenditures stem from Nielsen Media Research, as published in *Media Perspektiven;* data on aggregate household consumption, and GDP were retrieved from Eurostat.

Compared to annual data, quarterly data contain additional information on causal relations that occur within one year.[26] Due to the German reunion in 1990, only German data from 1991 onward are used. Because advertising expenditures strongly decrease from 2010 onwards due to the financial crisis, the observation period ends in fiscal quarter 4, 2009. German data were selected due to the size of Germany's economy and the lack of research on German data, compared to U.S. or U.K. data. All data are deflated by the Organisation for Economic Co-operation and Development (OECD) Consumer Price Index to eliminate possible inflation noise. Furthermore, data were seasonally adjusted because all variables follow a specific pattern over the four quarters of each year. By cleaning up the seasonal component, we make sure that our results are not merely based on spurious correlations of these short-term movements, but effectively capture the fundamental relation between the variables.

Figure 2 plots multiplicative seasonally adjusted quarterly advertising expenditures, private consumption, and GDP against time. Observations are z-transformed by subtracting the mean and dividing by the standard deviation. Thus, we can display all data on one scale that indicates

the standard score (i.e., the signed number of standard deviations of which the data are above or below the mean (0)). From visual observation, the fourth quarter in 2000 of advertising expenditure forms a clear break in the series. Advertising expenditures seriously dropped after the dot-com crisis due to a loss of confidence in business.[27]

Figure 2: Advertising Expenditures, Private Consumption, and GDP (Seasonally Adjusted, Z-Standardized)

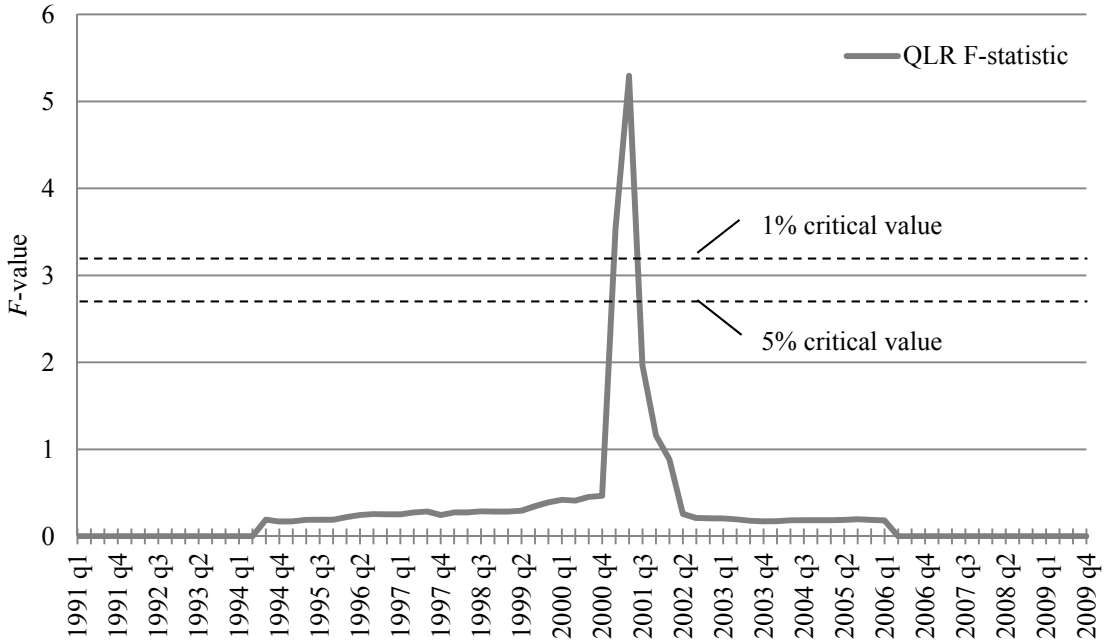


Besides the burst of the dot-com bubble in March 2000, the observation period from 1991 to 2009 includes further external global and local events that could confound the advertising-consumption relation. For example, the founding of European Union in 1993, the terrorist attack on September 9, 2001, in New York, the introduction of the Euro currency in January of 2002 or even the 2006 FIFA World Cup in Germany could change consumer or business confidence and therefore purchasing or advertising investing decisions. Further, recessions or economic upturns can moderate advertising expenditures as well as private consumption. The German economy experienced several upturns (e.g., the German post-reunification boom phase until

1992, 2005 to 2008) as well as recessions (e.g., troughs in 1993, 1996, 2004, and 2009)[28] during the observation period.

To test potential impacts of external events to the data series, we apply break date analyses. Following Stock and Watson (2012), it is important to test for break dates in time series. The Quandt likelihood ratio (QLR) test[29] for unknown breaks with 15 percent trimming[30] calculates Chow breakpoint tests. QLR identifies the first and second quarter of 2001 as break dates (trimmed range of the sample, critical value for ten restrictions: 2.71 ($p < .05$) and 3.23 ($p < .01$).[31] **Figure 3** displays the *F*-values. The break follows after the burst of the dot-com bubble in fiscal quarter 1, 2000, and the strong cutback in advertising expenditures in fiscal quarter 4, 2000. Since no other breaks are detected, the conclusion can be drawn that no further external event has had a statistically significant impact on the advertising-consumption relation. Therefore, the relation between advertising and consumption will be separately estimated before fiscal quarter 4, 2000, and after fiscal quarter 2, 2001, including GDP as control variable. Because of the small number of observations in each period (n = 34), we try to minimize the number of included regressors.

Figure 3: Quandt Likelihood Ratio Test on Advertising Expenditures and Consumption Model



Measures

The relation between advertising expenditures and consumption is estimated using VAR modeling, Granger-causality tests, and irf. Since VAR modeling is a persistence modeling procedure[32] and allows dynamic and interdependent analyses between intervening variables of different time lags without the a priori definition of endogenous or exogenous variables,[33] it can well be employed to the dynamic advertising-consumption relation.

Before estimating the advertising-consumption relation in a VAR, we tested the relation between consumption and GDP as well as advertising and GDP by estimating separate VAR models. For consumption, current GDP and GDP of the first lag are relevant. On the other hand, GDP and advertising are in no relation. Therefore, current GDP and the first lag of GDP are included to the advertising-consumption model as external variable. The resulting VAR model for consumption (C) and advertising expenditures (A), including p lags as well as GDP (G), can be written as advertising and consumption equations

$$A_t = \mu_1 + \pi_{11}A_{t-1} + \pi_{12}C_{t-1} + \ldots + \pi_{1p}A_{t-p} + \pi_{1p}C_{t-p} + \lambda_1 G_t + \lambda_{12}G_{t-1} + u_{1t}$$

$$C_t = \mu_2 + \pi_{21}C_{t-1} + \pi_{22}A_{t-1} + \ldots + \pi_{2p}A_{t-p} + \pi_{2p}C_{t-p} + \lambda_2 G_t + \lambda_{22}G_{t-1} + u_{2t}$$

where μ, π, and λ are coefficients and u_1 and u_2 are the error terms.

Commonly used augmented Dickey–Fuller (ADF) test, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test and Zivot-Andrews unit root test allowing for one structural break prove that neither advertising expenditures nor consumption first differences contain unit roots but are trend and level stationary (see Appendix A). As a standard procedure, seasonal components are eliminated from the consumption and GDP series by including external dummy variables. Due to different seasonal patterns before and after 2001, advertising expenditures are deseasonalised before estimating the VAR. The appropriate lag order of the VAR model is selected using Akaike's information criterion, Schwarz's Bayesian information criterion, the Hannan–Quinn's information criterion, and Wald lag exclusion statistics. VAR model adequacy is verified using Lagrange multiplier test for residual serial correlation and Portmanteau test and Bartlett's (B) statistic for white noise in the residuals (see Appendix C). Please see Appendix B for advertising and consumption coefficients of the VAR models.

ESTIMATION RESULTS AND DISCUSSION

The break in 2001 proves true since different advertising-consumption relations can be detected before and after 2001. The results of Granger-causality tests in Table 1 show that consumption tends to be better predicted when changes in advertising expenditures are taken into account before 2001. The irf results in
Figure 4 also show a tendency of advertising impacting consumption—for both periods. Likewise, the VAR coefficients confirm that changes in advertising expenditures influence future consumption before and after 2001 (Appendix B). After 2001, advertising expenditures can be predicted better using previous changes in consumption. Irf in Figure 5 support this result: after 2001, a change in consumption will cause a positive change in advertising expenditures in the next quarter. Before 2001, there was no impact of consumption on advertising. The underlying VAR (Appendix B) identifies coefficients of consumption of lags

one, two, and three as influencers of advertising expenditures after 2001. Therefore, the strong effect of consumption changes on the next quarter might die out until three quarters ahead.

In sum, the influence of advertising on consumption exists throughout the observation period, which is in line with the activist view. But the impact of consumption on advertising evolves only after the dot-com crises and the drop of advertising expenditures. Therefore, after 2001, private consumption helps to predict corporate advertising expenditures. On a macro level, this result supports the deterministic point of view.

Within the next paragraphs, we interpret these findings from a meso perspective (i.e., we discuss what might have changed with the organization's budget-setting process).

Table 1. Granger-causality Test Before and After the Break in 2001 q1 and q2

Causal direction	1992 q2 – 2000 q3		2001 q3 – 2009 q4	
	F	*p*	*F*	*p*
Advertising expenditures → consumption	1.6588	0.0967	1.7838	0.1717
Consumption → advertising expenditures	2.3716	0.2036	3.2622	0.0326

Note. n = 34 observations each, 1992 q2 – 2000 q3 and 2001 q3 – 2009 q4

Figure 4: Impulse Response Function of Advertising Expenditures → Consumption

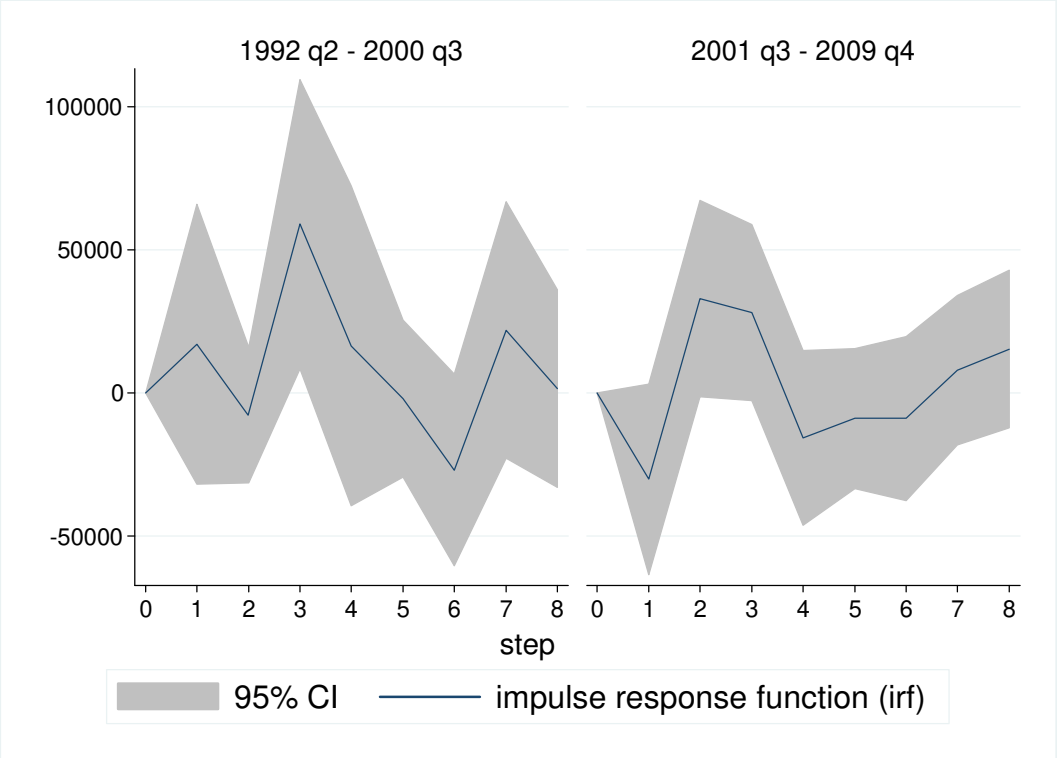
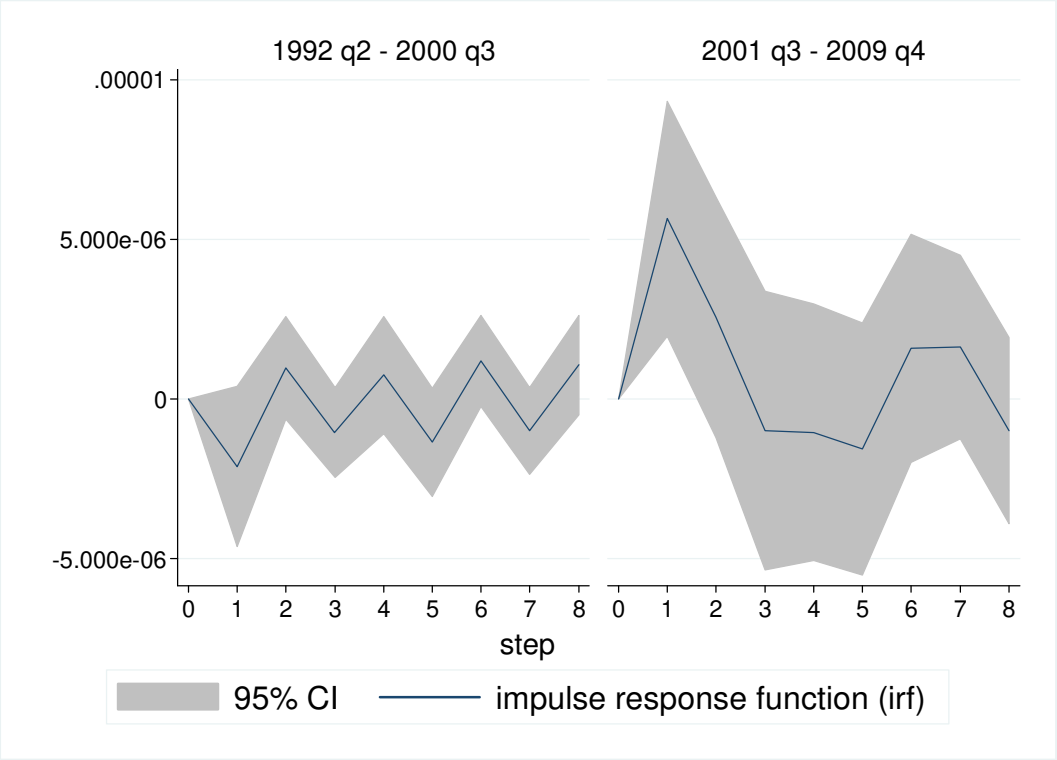


Figure 5. Impulse Response Function of Consumption → Advertising Expenditures



First of all, these results are in line with observations that a new generation of marketing manager pays closer attention to strengths and opportunities.[34] There are also findings indicating that companies adjust their marketing strategy and activities during recessions and are thus more reactive to consumer behavior during crises.[35] In this respect, the crisis might have served as a catalyst to foster a general trend among decision makers to rely more heavily on data.[36] Studies also show that, in times of uncertainty, planning horizons become shorter,[37] and scholars argue that "real option" approaches are more suitable than commonly used static decision-making frameworks.[38] Here, the idea is to pursue a dynamic and flexible decision-making process; that is, to constantly incorporate new information in order to get better results.[39] In addition to that, Deleersnyder et al.[40] show that, with higher stock market pressure, advertising expenditures react more sensitively to economic situations. As stock market pressure may have increased since the dot-com crisis, advertising activities are more closely

adjusted to consumer behavior. To sum it up, the impact of consumption on advertising expenditures after the crisis can be interpreted as the result of a more short-term-oriented and data-driven decision-making process due to the uncertainties managers were facing. Hence, a deterministic advertising budgeting may not involve mechanical decisions, but, rather, is dynamically consumption driven. In general, consumer choice is important to a company's marketing strategy,[41] which is especially true during crises. Dutt and Padmanabhan[42] argue that the impact of a crisis on a company is best understood by considering changes in consumer behavior. Further, during the last decade, managers may have increasingly recognized that successful marketing requires understanding of and reacting to the demand side. This new mindset is essential for successful resonance marketing,[43] which adapts to changes in consumption. The burst of the dot-com bubble might have operated as a catalyst leading to more carefully planned advertising activities considering external information, such as previous consumer choice instead of expected demand.

SUMMARY AND CONCLUSIONS

This study assesses the relation between advertising expenditures and consumption in a VAR model using German quarterly data from 1991 to 2009. Results reveal that macroeconomic relations may not be stable over time. Changes in relations can occur due to breaks caused by major, dramatic events in the environment. The advertising-consumption relation is susceptible to such breaks due to changes in corporate advertising activities.

The dot-com crisis in 2000 accounts for a strong negative impact on advertising expenditures in 2001. Separate analyses of the periods before vs. after the dot-com crisis show that this dramatic event inverted the Granger-causality between advertising expenditures and consumption. Before the crisis, the estimation shows that advertising expenditures tend to Granger-cause consumption. From 2001 onwards, consumption changes can predict changes in advertising expenditures, revealing a closer adjustment of advertising activities to previous

consumer behavior and resulting revenues. Hence, periods of different causal relations between advertising expenditures and consumption exist and can be determined by detecting structural breaks. We argue that a change in advertising budgeting occurred since 2000 that is detectable on aggregate level. This change incorporates a higher relevance of previous consumer behavior for decision making about advertising budgeting. Since the results also indicate an influence of advertising on consumption, this study finds support for a circular advertising-consumption relation.

To establish our findings, the relation between consumption and advertising expenditures must be explored before and after other recent crises in different countries. In addition, it may be valuable to assess differences in this relation for various media, between consumer and durable goods, and industries. As our study draws conclusions on a micro level using aggregate data that might lead to a loss of information,[44] it is desirable to analyze the advertising-consumption relation on temporal[45] and sectoral disaggregate levels. Yet, accessing advertising expenditure data on a disaggregated level is often difficult.[46]

We conclude that, besides the economic cycle, consumer behavior is relevant for the prediction of advertising activity of companies. The drop of advertising expenditures after the dot-com crisis is a dramatic event that changed advertising behavior in Germany in terms of a closer adaptation of advertising budget to previous consumption. Changes in consumption behavior have become more relevant than ever for the advertising income of media companies today.

Appendix A: Augmented Dickey–Fuller (ADF) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) Tests for Stationarity

Variable	ADF test	KPSS test[b]		Zivot-Andrews test
	Test statistic[a]	Trend stationarity test statistic[c]	Level stationarity test statistic[d]	Minimum t-statistic[e]
Advertising expenditures	-13.30 Conclusion: no unit root	.06 Conclusion: trend stationary	.10 Conclusion: level stationary	-13.85 Conclusion: trend stationary process that allows for a one time break
Consumption	-10.22 Conclusion: no unit root	.04 Conclusion: trend stationary	.37 Conclusion: level stationary	-10.80 Conclusion: trend stationary process that allows for a one time break

Note.

[a] Critical value for H0: "*Y* contains unit root" is -3.475 at the 5% level of significance.

[b] Test statistics are reported at lag order 4.

[c] Critical value for H0: "*Y* is trend stationary" is 0.146 at the 5% level of significance.

[d] Critical value for H0: "*Y* is level stationary" is 0.463 at the 5% level of significance.

[e] Critical value for H0: "*Y* is a unit root process with drift that excludes exogenous structural change" -5.08 at the 5% level of significance.

Appendix B: VAR Coefficients of Advertising Expenditures and Consumption

1992 q2 – 2000 q3

Consumption equation									
Advertising expenditures	Coef.	Std. Err.	*t*	*p*	Consump-tion	Coef.	Std. Err.	*t*	*p*
A_{t-1}	1.70E+04	2.50E+04	0.68	0.50	C_{t-1}	-0.42	0.16	-2.56	0.02
A_{t-3}	5.63E+04	2.60E+04	2.16	0.04	C_{t-2}	0.02	0.08	0.20	0.84
A_{t-4}	5.05E+04	2.82E+04	1.79	0.09	C_{t-3}	0.21	0.10	2.23	0.04
Advertising exenditures equation									
Advertising expenditures	Coef.	Std. Err.	*t*	*p*	Consump-tion	Coef.	Std. Err.	*t*	*p*
A_{t-1}	-0.04	0.19	-0.19	0.85	C_{t-1}	-2.11E-06	1.28E-06	-1.65	0.11
A_{t-3}	-0.45	0.20	-2.25	0.03	C_{t-3}	-7.10E-07	6.01E-07	-1.18	0.25
A_{t-4}	0.41	0.22	1.87	0.08	C_{t-4}	-6.00E-07	7.42E-07	-0.81	0.43

2001 q3 – 2009 q4

Consumption equation									
Advertising expenditures	Coef.	Std. Err.	*t*	*p*	Consump-tion	Coef.	Std. Err.	*t*	*p*
A_{t-1}	-3.02E+04	1.70E+04	-1.78	0.09	C_{t-1}	-0.30	0.19	-1.60	0.13
A_{t-2}	2.21E+04	1.69E+04	1.31	0.21	C_{t-2}	-0.15	0.21	-0.71	0.49
A_{t-3}	1.77E+04	1.03E+04	1.72	0.10	C_{t-2}	0.03	0.19	0.17	0.87
A_{t-4}	1.30E+04	5.46E+03	2.37	0.03	C_{t-3}	-0.45	0.16	-2.87	0.01
Advertising expenditures equation									
Advertising expenditures	Coef.	Std. Err.	*t*	*p*	Consump-tion	Coef.	Std. Err.	*t*	*p*
A_{t-1}	-0.06	0.17	-0.33	0.74	C_{t-1}	5.65E-06	1.87E-06	3.01	0.01
A_{t-2}	-0.40	0.17	-2.33	0.03	C_{t-2}	4.57E-06	2.11E-06	2.17	0.04
A_{t-3}	-0.07	0.10	-0.66	0.51	C_{t-3}	4.05E-06	1.89E-06	2.15	0.04
A_{t-4}	0.06	0.05	1.06	0.30	C_{t-4}	1.48E-06	1.57E-06	0.94	0.36

Appendix C: Post Estimation of VAR Residuals

Lagrange Multiplier Test

H0: No autocorrelation at lag order

Lag	1992 q2 – 2000 q3			2001 q3 – 2009 q4		
	χ^2	*df*	*p*	χ^2	*df*	*p*
1	1.73	4	0.79	6.34	4	0.17
2	6.66	4	0.15	3.38	4	0.50
3	3.48	4	0.48	5.44	4	0.25
4	7.14	4	0.13	6.07	4	0.19
5	7.10	4	0.13	3.31	4	0.51
6	3.72	4	0.45	1.20	4	0.88

White Noise Tests

Estimation	Portmanteau (Q) test		Bartlett's test	
	H0: No serial correlation		H0: White-noise process	
	Q statistic	*p*	B statistic	*p*
1992 q2 – 2000 q3	12.44	0.65	0.47	0.98
2001 q3 – 2009 q4	16.96	0.32	0.46	0.99

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